Journal of the Royal Society of Arts

NO. 5007 | FRIDAY, 5TH JULY, 1957 | VOL CV

BICENTENARY MEDAL FOR 1957

The Council has awarded the Bicentenary Medal for 1957 to Sir Ernest Goodale, C.B.E., M.C., a Vice-President and past Chairman of Council of the Society, and Chairman of its Industrial Art Bursaries Board.

Sir Ernest Goodale is chiefly associated with the textile industry, in which his name is internationally known, but in the course of a very distinguished career his contribution to the development of art and design in industry as a whole has been very widely felt and recognized; and his experience, great knowledge, taste and counsel have been placed unstintedly at the service of all those who seek to promote these objects.

His influence in this field was first felt before the War, through his membership of the Council for Art and Industry, the predecessor of the present Council of Industrial Design, on which he also served as a member from 1945–49. Since 1953 Sir Ernest has also been President of the British Colour Council, and since 1949 Chairman of the Industrial Art Committee of the Federation of British Industries (of which he is a Vice-President). In 1939–40 he was President of the Textile Institute, and he has recently been accorded the singular honour of election to that office for a second term. He was a member of the Council of the Royal College of Art from 1950–53.

Sir Ernest has also been very prominently concerned with the promotion of exhibitions. He was a member of the Ramsden Committee on Exhibitions and Fairs in 1945, and of the Board of Trade Exhibitions Advisory Committee in 1956. He was chairman of the sub-committee on the British Industries Fair which produced the 'Goodale Report' in 1953, and chairman of the British Industries Fair from 1954–56.

As Fellows will remember, the Bicentenary Medal was instituted in 1954 as a permanent commemoration of the Society's Bicentenary, and is given annually 'to the person who in a manner other than as an industrial designer has exerted exceptional influence in promoting art and design in British Industry'.

ROYAL DESIGNERS FOR INDUSTRY

On the recommendation of the Joint Committee of the Society and the Faculty of Royal Designers for Industry, the Council has appointed Mr. Misha Black, O.B.E., F.S.I.A., M.Inst.R.A., to the distinction of 'Royal Designer for Industry' (R.D.I.), 'for exhibition and interior design'.

Mr. Black, who was born in 1910, is a senior partner in Design Research Unit, a Past-President of the Society of Industrial Artists, a member of the Council of Industrial Design, and of the Advisory Council of the Institute of Contemporary Arts. Since 1928 he has designed exhibitions for the United Kingdom Government, U.N.E.S.C.O. and others, in Great Britain, France, Belgium, Ireland, the U.S.A. (at the New York World's Fair in 1939), Spain, Italy, Mexico, Ceylon, India and Southern Rhodesia. During the Second World War he served at the Ministry of Information as Principal Exhibition Architect.

The public will remember particularly Mr. Black's outstanding contribution to the 1951 Festival of Britain, when he was co-ordinating architect for the Upstream Section of the South Bank Exhibition, co-architect for the Regatta Restaurant and Chief Designer for the Dome of Discovery. Notable amongst his achievements since then have been his work as Industrial Design Consultant to B.O.A.C. at the new London Airport, and in the interior design of the Time-Life Building in Bond Street (for which he was jointly responsible with Sir Hugh Casson, R.D.I.).

INDUSTRIAL ART BURSARIES COMPETITION

The winning and commended designs submitted in the 1956 Industrial Art Bursaries Competition, which have already been displayed in London and High Wycombe as previously announced in the *Journal*, will be on view at the Falmouth School of Art, Kerris Vean, Woodlane, Falmouth, Cornwall, between the 10th and 24th July.

MEETING OF COUNCIL

A meeting of Council was held on Monday, 17th June, 1957. Present: Dr. R. W. Holland (in the Chair); Mrs. Mary Adams; Sir Alfred Bossom; Sir Edward Crowe; Mr. Robin Darwin; Mr. P. A. Le Neve Foster; Mr. John Gloag; Mr. Milner Gray; The Earl of Halsbury; Sir William Halcrow; Mr. William Johnstone; Mr. F. A. Mercer; Mr. Oswald P. Milne; Lord Nathan; Mr. A. R. N. Roberts; Sir Selwyn Selwyn-Clarke; Professor Dudley Stamp; Sir Stephen Tallents; Mr. G. E. Tonge; Sir Griffith Williams, and Miss Anna Zinkeisen; with Dr. K. W. Luckhurst (Secretary); Mr. G. E. Mercer (Deputy Secretary) and Mr. J. S. Skidmore (Assistant Secretary).

ELECTIONS

The following candidates were duly elected Fellows of the Society:

Clark, Frank William, London.
Conway, John Alan Thomson, New South Wales, Australia.
Durrant, Derek Walter, London.
Evans, Mrs. Sybil Charlotte, A.T.D., Pontypool, Monmouthshire.
Foley, Mrs. Muriel, St. Helens, Lancashire.
Gray, Chester Marmion, O.B.E., E.D., M.Sc., A.M.I.E.(Aust.), Victoria, Australia.
Green, Leonard, Wollaston, Worcestershire.
Green, Maurice George, N.D.D., Ilford, Essex.
Hagger, Donald, Stockport, Cheshire.
Hales, Gordon Hereward, Watford, Herts.
Hatherly, David Anthony Ashford, Hampton-on-Thames, Middlesex.
Higgins, George, Liversedge, Yorkshire.
Horn, Andrew Hamilton, London.
Howard, Francis Aylmer, A.R.I.B.A., Blandford, Dorset.
Lydon, Gerald Kenneth, Sutton, Surrey.
Lyon, Kenneth, N.D.D., A.T.D., Westcliff, Essex.
MacCarthy, Charles Patrick, Monkseaton, Northumberland.
Mason, George Braik, Jnr., Rutherglen, Glasgow.
Moffett, William Noel, B.Arch., A.R.I.B.A., London.
Moore, Henry, Leeds, Yorkshire.
Morris, Charles Stephen, B.A., M.A. (Education), London.
Paterson, Francis George, Mayfield, Sussex.
Pearce, Derrington Stanley, A.R.I.B.A., Bexleyheath, Kent.
Ransome Smith, Frederick William Henry, Ingatestone, Essex.
Rebajes, Francisco, New York, U.S.A.
Russell, Professor Richard Drew, R.D.I., F.S.I.A., London.
Serlachius, Ralph Erik, Mänttä, Finland.
Stephens, Gwyn Owen, B.Sc., Ph.D., F.Inst.P., Colchester, Essex.
Tanner, Sidney Charles, Portsmouth, Hants.
Vasey, Gilbert Howard, B.C.E., A.M.I.M.E., Victoria, Australia.
Wickham, Denis Arthur, F.L.A., Grays, Essex.
Wilkinson, Miss Patricia Mary, B.V.Sc., M.R.C.V.S., London.

The following were admitted as Institutions in Union under Bye-Law 66:

Bibliothèque de l'Université, Louvain, Belgium.
Walker Art Center, Minneapolis, U.S.A.

FINANCE AND GENERAL PURPOSES COMMITTEE

Mr. F. A. Mercer was appointed to the Finance and General Purposes Committee to fill the vacancy created by the death of Sir John Simonsen.

R. B. BENNETT EMPIRE PRIZE

The name proposed by the Commonwealth Section Committee for the 1957 award of the R. B. Bennett Empire Prize was approved for submission to His Royal Highness the President. It was also agreed to change the title of the prize for future awards to the 'R. B. Bennett Commonwealth Prize', and to amend the terms of reference for the award accordingly.

SIR GEORGE BIRDWOOD MEMORIAL LECTURE

It was decided that in future the scope of the Sir George Birdwood Memorial Lecture should be defined as covering 'subjects relating to the art, literature, and social phenomena of India and Pakistan'.

NATIONAL ADVISORY COMMITTEE ON ART EXAMINATIONS

The Committee appointed at the last meeting submitted its comments on the recent Report of the National Advisory Committee on Art Examinations, which were approved for transmission to the Minister of Education.

ROYAL DRAWING SOCIETY

In response to a suggestion by the President of the Royal Drawing Society it was agreed that the Royal Society of Arts should revive its early practice of making an award in connection with the Annual Exhibition of that Society.

EXAMINATIONS

It was reported that the number of entries for the Summer series of Examinations was 110,494, as compared with 97,493 in 1956.

OTHER BUSINESS

A quantity of financial and other business was transacted.

THE CONTRIBUTION OF LIGHTING TO MODERN LIFE

Three Cantor Lectures

I. LIGHTING IN OUTDOOR LIFE AND WORK

by

J. M. WALDRAM, B.Sc., A.M.I.E.E., F.Inst.P., F.I.E.S.

Monday, 18th February, 1957

On two former occasions, in 1934 and in 1950, I had the honour to address the Royal Society of Arts, on both occasions on the subject of the lighting of streets. In the present series of Cantor Lectures, two of my colleagues are joining me in discussing a much wider subject: the 'Contribution of Lighting to Modern Life'; and it falls to me to discuss its contribution to life and work outdoors, a section of the subject which touches on street lighting and much besides.

About 18 months ago I went to Scotland in a hurry. I had to be at a dinner in Largs; my haste is explained by the fact that we had moved house only the day before. It is a comment upon the modern life which we are to discuss, that I was able to have tea in our new house near London, and have dinner in Largs on the same evening. But my reason for referring to this trip is an experience which befell me next day, on the way home. We flew from Renfrew to London Airport, at about 17,000 ft., on one of those sparkling clear nights which in this country are all too rare; and as we traversed the greater part of the length of this island, I beheld one of the most striking sights I have ever seen, though I have travelled by air a good deal.

Below me, as far as the eye could see, was spread a beautiful and intricate pattern, a lacework in gold and green and white on a rich black ground; here a single jewelled thread, there leading to a most complex embroidery as we passed over a town. There was the splendid coruscation of Blackpool; later the triple masses of Wolverhampton, Birmingham and Coventry, all three together like three fine doilys on a black table. Far on the horizon Dublin glowed across the sea. Then as we came lower there was the great mass of London, shimmering and twinkling from horizon to horizon, incredibly vast; till we came much lower and our view became more detailed and familiar.

It would have been an unimaginative man who could see such a view unmoved; for a lighting engineer it had a special interest. I saw the scale and sweep of all the activities in which men engage: in streets, cars, and 'buses, in shops, and houses, and factories, in trains, marshalling yards, theatres and cinemas and churches, schools and offices, docks and canals. All these we use after dark, and for all of them artificial light is essential if they are to go on at all. One might,

of course, discuss whether we are wise so to continue after dark, using our resources of energy to provide artificial light when there is much daylight unused in the earlier hours during the summer; but that is another subject. The pattern of modern life is so firmly established that we have to reckon with it; and without artificial light almost all of it after dark would cease. Our experience in the black-out taught us much—including the fact that enough light to permit some social life after sunset, as well as essential work and movement, was necessary to our existence.

It is worth while considering for a moment the reasons why light is so necessary. All ordered activity requires a flow of information which must reach us on an enormous scale, if we are even to move about; it reaches us through our senses, and of these by far the most important is the sense of sight. It is not the only one; as a rough generalization, one can say that sight is specially adapted for conveying information about material things, and sound, in the form of language and music, for transmitting abstract ideas. A blind man is cut off from the material world, and a deaf man from the world of ideas and relationships, which may be worse, though it occasions less sympathy.

The mechanism whereby light released from lamps is modified, reflected and interreflected, analysed by the process of sight and finally interpreted, is almost incredibly complex, leaving far behind the most advanced modern computers. Fortunately lighting engineers are concerned with only a tiny part of the process, for we merely provide and locate the lamps and their associated equipment in order to serve this intricate and delicate sense of seeing, in the many different activities in which we engage. But though our part is small, without it the show would stop.

When we are outdoors, the objects which we need to see are often a long way away, and of great physical size. It is natural, therefore, that we use light outdoors in two ways; sometimes, when we need a great deal of information, we illuminate large regions, floodlighting them so that we can see much as we do in daylight; but as this is often prohibitively costly, where the distances are large and the amount of information required is small, light is often used as a signal or beacon, giving specialized information by means of a code, which is much simpler and often more certain. Examples of both methods will appear in this lecture.

Let us now look at some of the things that we do outdoors, and in more detail about the way in which light assists us. Since we are already in imagination in the air, let us go first to the pilot's cockpit and see the world from there.

Aircraft in flight to-day are guided and controlled almost exclusively by radio and flown by instruments; indeed, for most of the flight they are flown by automatic pilots. In flight, there is little need for the pilot's window. But it is not yet possible to take off or land safely enough for passenger operation using radio alone, nor would radio permit the aircraft to be manoeuvred on the airport. Radio methods bring the aircraft through what is called a 'portal', an imaginary aperture in space ahead of and in line with the runway, so that it is located in a position, at a height and at a heading from which the landing can be completed visually. At a point called the 'break-off point', the pilot asks his co-pilot whether

the lights are visible, and only if they are will he continue with the landing, for he cannot return to instrument flying once he has abandoned it for visual flying. He has, therefore, to be provided with a pattern of lights of such a kind that he can tell, even when low visibility restricts the amount of the pattern that he can see, where he is, and in what attitude relative to the ground plane, so that he can tell immediately what action to take to make his final corrections. This is perhaps the most elaborate example of light used as a beacon. Figure 1 shows the pattern, in clear weather.

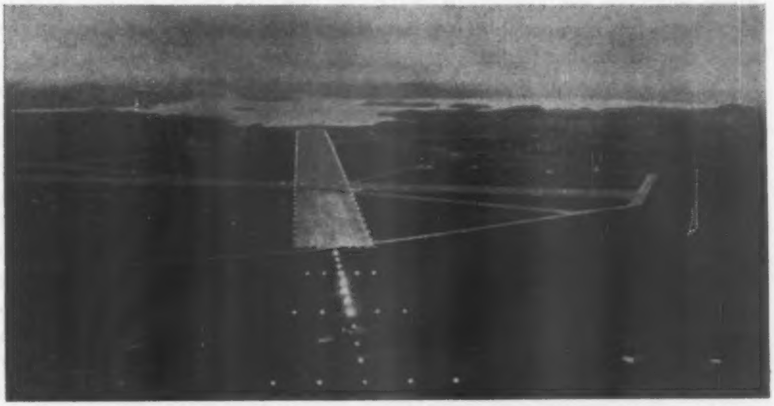

FIGURE 1. *Part of 'line and bar' approach and runway contact system at Stavanger Airport, seen from the air in clear weather*

This apparently simple pattern was evolved having in mind the principles of perspective and the particular problems of the pilot, so that he can immediately interpret it even if only the nearer part is visible, and can, for example, distinguish between the case when the aircraft is not on track, and when it is not level. It is the 'line and bar' system devised by E. S. Calvert, of the Royal Aircraft Establishment, who has made the most notable contributions to this difficult problem.

The lights at either side of the runway are scarcely less important than the approach lights. They may have to be run over by a heavy aircraft, which imposes very stringent design requirements; or, in later designs, they may be upstanding at the side of the paved runway, made very light and with a weak support so that if struck they will break and do no damage to the aircraft. This design gives higher intensities, and is not affected by snow or grass. Other types are being considered.

When the aircraft has landed, it is just as necessary to guide it safely and quickly off the runway, and by the proper route, to the right spot on the apron for the discharge of passengers. It is surprisingly easy to miss the way in the

dark; any hold-up in the taxiways soon means that the runway cannot be cleared for the next aircraft, and the whole service is delayed; when aircraft are arriving at one a minute such a delay is most costly, and with jet engined aircraft it is not tolerable. Such a small element as a taxiway light is therefore important.

There are, of course, many other lights essential to the technical maintenance of air travel services: the lights carried by the aircraft as position lights, recognition lights, landing projectors and signalling lamps, and on the ground, obstruction lights, beacons, signals, landing direction indicators, glide path indicators, and finally floodlights at the apron. In the days of small grass aerodromes, the whole aerodrome was floodlighted for the pilot to see his way in; but with modern aerodromes this is impossible: it is not until we come to the smaller area of the apron that we use floodlights.

The airport building itself requires lighting for the benefit of the passengers, but that, being indoors, is in my colleagues' territory. I must wait until the passengers emerge from the buildings and go to their car. The car itself carries many lights; modern cars carry 25 or more. The car is a good example of the two functions of light outdoors. The driver needs much detailed information about the way ahead, so he is provided with headlights which illuminate it, and he views it much as in daylight. But he need provide only limited information to other drivers about his intentions, so that at the rear of his car he carries merely signal and beacon lights, of low power—some, perhaps, not low enough.

These lighting systems provide many interesting and very complex problems, which have been intensively studied by international working parties for many years. They were discussed in the Cantor Lectures in 1951 by Dr. Glanville, Director of the Road Research Laboratory, and I need, therefore, say little about them. One or two points may, however, be made. The first is that the design of headlighting systems is bedevilled by a fundamental geometrical requirement—that the headlights must be attached to the car. They must, therefore, be close to the driver's eyes, and close to the road surface. From this condition there flow all sorts of difficulties. One is that the headlights must be of considerable intensity, or the driver will not be able to see far enough for safe driving. This in turn, coupled with the geometry, results in unavoidable glare to oncoming drivers. The problem then becomes one of providing drivers with enough light to see by, without producing so much glare as to undo the work of the headlights. There is no problem in making an effective headlight if there is no oncoming driver to worry about; neither is there any difficulty in avoiding glare to him if one has not to see oneself: the difficulty is in reconciling the two. The designer's problem is to achieve the best balance; and here he meets another problem in the variations and permissible tolerances in the elements of the headlight itself, and its mounting in the car, the loading of the car, and the variations in contour of roads likely to be encountered. The problem becomes largely statistical. It is not difficult to produce beams with an extremely sharp cut-off, capable of giving a fair driving distance with little glare when exactly set on a level road; the problem is to keep them sharp and pointing where they were intended to, with respect to both the road and the other driver. With such a beam, maladjustment or

misaim is catastrophic. Those who criticize the newer designs of headlight meeting beams on the score of glare would be wise to reconsider their findings from the point of view of *overall* safety in all conditions of road and with practicable lamps.

The latest headlights are, I believe, a step forward; but I am less convinced about development at the other end of the car. The obligatory and signal lights now provided seem to me to be in some cases confusing, difficult to interpret, and likely to be misleading in the event of a filament failure in one lamp. The first winking direction indicators, indistinguishable from the brake indicator and the obligatory rear lights, were particularly bad. However, later developments in which the direction indicators are amber are less objectionable. Perhaps the ideal system would separate both spatially and in colour the signal lights—both the direction indicators and the brake indicators—from the red obligatory rear lights, and would use steady and not intermittent signals.

The present indications are an example of an undesirable tendency in lighting for traffic, in which the designer of each feature, convinced of its importance, tends to make it more and more clamant. American-type rear lights and brake indicators, designed presumably for very high speeds on straight and level roads, are much too powerful at night, and are distracting to the point of danger. The task of driving on a wet night in the rush hour in an unfamiliar town must come close to the limit of human performance, when the driver has not only to control his vehicle but also find his way, avoid other vehicles and pedestrians, observe pedestrian crossings, traffic signals, the signals of other vehicles and the signals of policemen, and to sort out all these indications from a galaxy of advertisements and other extraneous lights. What is needed is not more and more clamant signals, but co-ordinated signals, both on the vehicles and at the roadside. Such signals cannot be designed in isolation; they must be designed with due reference to all the other signals that the driver must watch, so that the important things are made obvious. To use a term which has recently come to the fore in other aspects of lighting, we need good and careful design of his visual field.

The lighting of pedestrian crossings is an interesting example. Those responsible decided after much experiment to adopt a beacon rather than a floodlight, in my opinion rightly. The case against floodlighting was summed up by one observer who said: 'On a dry night, it isn't necessary; on a wet night it doesn't always work'. The system of beacons is cheap and simple, and uses a beacon already familiar. But if this or any other system is to be a contribution to safety, something more is needed. The object of pedestrian crossings is to provide a path for pedestrians safer than a random crossing; and they attempt to do so by giving him when on the crossing certain legal rights. But legal rights give no physical protection. They work only if everyone concerned knows that they exist, and that certain identifiable pedestrians possess them and are about to exercise them. If there is any doubt about this, the crossing may be more dangerous than a random crossing where the pedestrian knows that he must look out for himself. Taken in isolation, a pedestrian crossing is a good idea; but it ceases to be a good idea if crossings are set close to one another at a confusing

junction, so that the driver is faced with a medley of winking lights which he cannot easily read. At such places, the whole visual field of the driver needs to be carefully designed, not on the drawing board, but on the site, having all directions of driving in mind.

The streets themselves are an example of the other use of light: to light large areas so that vision can take place normally. In previous lectures I described the mechanism by which this is brought about, and the devices used by the street lighting engineer to produce adequate seeing conditions with an expenditure of power far below what would be used for such an area in an interior. In the seven years since those lectures, developments have been more on matters of detail than of fundamental principle, with a few exceptions. The engineer has a few more tools and rather more freedom.

Of the tools at his disposal, there are some lamp developments. The high pressure mercury vapour lamp is now available with a fluorescent envelope of much improved performance, giving a colour which is nearly white. This lamp has been used enthusiastically on the Continent, in France, the Netherlands and Spain and, to some extent, in Germany. In England it has curiously enough moved slowly, partly on account of its cost and partly because the light from it is difficult to control.

Sodium lamps have been improved; there is now for example a lamp in which the thermal insulation is provided by a jacket integral with the inner, instead of being detachable, which permits a better lamp and improved efficiency. Lamps

FIGURE 2. *Recent lighting installation in the Avenue des Champs-Elysées, Paris, using a combination of high-pressure mercury-vapour lamps and tungsten-filament lamps. The original lanterns and standards have been retained with similar lamps.* (Mazda/Boiron)

with maintained efficiencies of seventy lumens per watt are now available. The fluorescent lamp has been greatly improved in efficiency, lumen maintenance and life, to an extent seldom realized. A modern fluorescent lamp gives more than *six times* the light, in lumen-hours during life, given by the first lamps.

For the construction of lanterns, new processes have been called in; for example, injection moulding of plastics.

In France a notable installation has been made with high-pressure mercury fluorescent lamps on the Autoroute de l'Ouest, a main double carriageway road leading out from Paris via St. Cloud. It is lighted by a system basically the same as that used before the war in the Sidcup Bypass, but both the height and the spacing are increased, and high-pressure mercury fluorescent lamps are used in a new type of cut-off lantern. Another recent installation in perhaps the most famous street in Europe, the Avenue des Champs-Elysées in Paris, uses lanterns in which a mercury fluorescent lamp is combined with a tungsten filament lamp (Figure 2).

The tubular fluorescent lamp has been used widely both in this country and on the Continent. In England we use careful optical control; on the Continent they more often use either diffusing envelopes or a form of cut-off fitting with control which is poor by our standards, but which is used at a very reduced spacing. Decorative lanterns using fluorescent lamps are being used to an increasing extent. A mushroom-shaped fitting is common in Germany, and is sometimes used here; Figure 3 shows such a lantern at Plymouth, specially designed for the newly constructed town centre.

FIGURE 3. *Mushroom-shaped lanterns with fluorescent lamps: Plymouth*

Another form is a simple vertical lantern, without optical control, used for its decorative effect in spite of its low efficiency. Figure 4 shows an installation at Aberdeen, of interest because the lamps used are cold-cathode tubes, of very long life, which are used in sealed lanterns which need not be opened except at intervals of five years. Smaller varieties of this lantern are also used, here and abroad, with hot-cathode fluorescent lamps.

Lanterns are also being used in unconventional positions, for example, fluorescent lanterns with the axis parallel to the street's axis. This gives very

FIGURE 4. *Vertical wall-mounted tubular sealed lantern with cold-cathode fluorescent lamps: Aberdeen*

little glare, and can give good results in narrow streets, but it requires a very short spacing. Figure 5 shows a fine but costly installation in Milan: 8–40 w. lamps on each column, spaced at 45 feet and 30 feet high. In Germany there is an increasing use of axially mounted lanterns at very short spacing, usually carried on elaborate spanwire suspensions. The axial system has also been used in this country, where it originated, using lanterns attached to the faces of buildings, which is in some respects to be preferred.

In Germany they also use slender steel or concrete columns, curving over the road like a daffodil with a long slender fluorescent reflector lantern which seems to grow like a bud from the stem. Figure 6 shows a double-arm installation. Such designs would surely occasion comment in British newspapers. In squares they use high straight masts which sprout into six or eight-way lanterns, like an expanded flower.

The lighting of bridges has been tackled in an unorthodox way. For aesthetic reasons it is often undesirable to use columns on a bridge, and various efforts have been made to make them inconspicuous, or to omit them altogether. On one German suspension bridge at Duisburg, slender short columns with inclined sodium lamps are used at very short spacing, but the installation does not light well to the centre of the carriageway. At another German installation, on a bridge

FIGURE 5. *Installation of lanterns with fluorescent lamps parallel with axis of carriage-way: Viale E Caldera, Milan*

over the Weser at Bremen, the portal has been outlined in a transverse line of lamps, a device which they have tried elsewhere. It has some advantages on a wet night, but less than might be supposed at first. Another suspension bridge has the suspension cables outlined in lights.

The most interesting and unorthodox attempt to light bridges and dams originated in the United States; it is to provide equipment in the handrails. This has been taken up in Belgium, where several bridges have been so lighted. The most ambitious is the fine and slender new bridge, the Pont des Ardennes, at Namur, lit with hot-cathode lamps in louvered fittings made of extruded aluminium sections which also form the handrail. This is a big bridge; the effect is interesting and quite good, though it depends markedly on the maintenance of a road surface with appropriate characteristics, and is not without glare. With continuous hot-cathode lamps there is perhaps too much light;

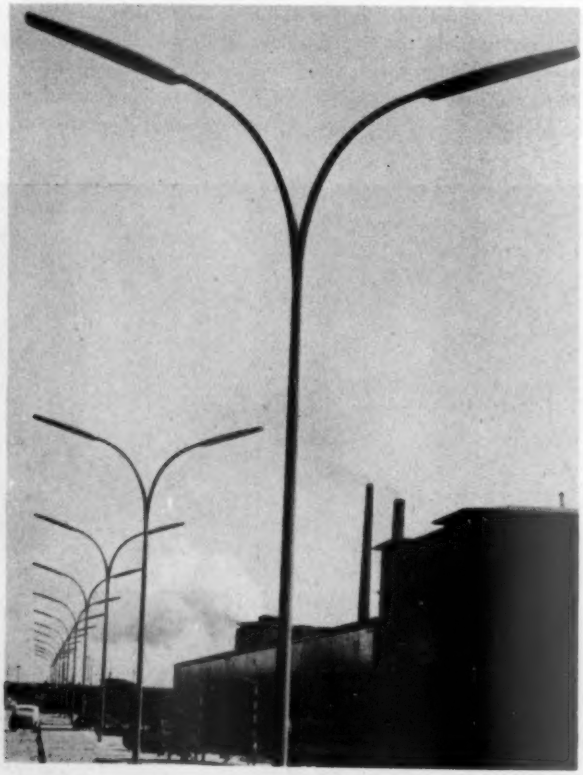

FIGURE 6. *Double-arm steel columns and inclined cut-off lanterns with tubular fluorescent lamps: Hamburg. (Hamburgische Elektrizitatswerke/Hellux)*

with cold-cathode lamps, as at the smaller bridge at Dinant, the amount of light is more modest. These installations are, however, very costly; they depart radically from conventional and efficient practice and would never do for lighting a street. On a bridge, however, some of the objections to them disappear; even so, the solution is not perfect.

But in these days we have to go by train. The whole traffic of London, and therefore its life, depends upon the underground railway system, which in turn is made possible only by the provision of artificial light of high quality in the stations and trains, and by elaborate light indicators. Without such lighting, the life of London would come to a standstill; the road congestion, already serious, would become unmanageable and roads would be locked solid with vehicles.

The railways provide another set of lighting problems, though few as complex as those on roads. For the train driver has not to find his way, or steer, or avoid other traffic, and pedestrians are removed from him. He has only his throttle and his brake. He does not need to see the road ahead. So we do not light it, and we return to signal lights only. (In America, where railways are not fenced, they have to carry headlights.) But because the speed and weight of his train are so great, and because its brakes are relatively poor, and since he cannot avoid an obstruction, signalling becomes of paramount importance. The old semaphore signal has lasted many years, but it has disadvantages at complex junctions, and on high-speed roads; elaborate interlocking is more simply carried out electrically than mechanically, and electric signals lend themselves to automatic working. The day colour light signals present the same aspect by night and by day, they can be read at much greater distances, especially in bad weather, and where the traffic justifies the expense of their installation they are replacing the semaphore type. There are two types of signal, the multi-lens signal, and the type called (for no good reason) the 'searchlight' signal in which all three aspects appear in a single lens. This is a rather elaborate apparatus. The light from the small lamp is condensed by an ellipsoidal mirror on to a small aperture covered by one of three colour filters in a miniature spectacle, moved by a relay mechanism. Thereafter the beam diverges and is rendered parallel by the main signal lens. Thus there are no more moving parts than in a relay, which is used by the thousand; the signal emitted can be positively proved by contacts on the spectacle; it is proof against phantom indication caused by the sun shining into the signal and giving a spurious indication, since the filter is in position all the time and only the intended signal could be seen; the equipment is small, which is an advantage on complex gantries where several signals are provided at different heights for different routes; and it is not affected by snow or ice.

Before trains can run they have to be made up; and the marshalling of goods trains goes on by day and night. To-day there are several very large marshalling yards upon which the functioning of goods traffic depends, and in which it is necessary to see. We recall the almost nightly raids which in the early part of the War were made on the marshalling yards at Hamm, in an attempt to disorganize the German railway system.

Marshalling yards are lighted by several systems; one frequently used involves the use of high towers with batteries of floodlights carefully trained to illuminate the area evenly. Figure 7 shows a new installation at a coal siding at a power station. When it is desirable to see very well between each track, and when the space available is limited, other methods may be used. The carriage cleaning sidings at Willesden are lighted by projectors over each track, carried on gantries which facilitate their maintenance.

FIGURE 7. *Floodlighting towers for a coal siding*

Large marshalling yards constitute some of the largest areas which are lighted overall to provide normal seeing. However, there is one further class of outdoor lighting installation which rivals them, which has lately come into prominence both here and abroad: the lighting of outdoor football fields. In America it has long been the practice to light for both baseball and American football, and some very large installations have resulted, with great areas lighted to very high levels; one as high as 200 lumens per square foot, for baseball. In baseball it is necessary to follow the flight of a small and very fast ball which often rises high, and the stadia are very large. In American football, which is (so far as a layman can judge) a game of deception, it is necessary to discern which of several

players really has got the ball; and from the back of some of their very large stadia, this involves the seeing of quite fine detail.

In this country, there has been lately considerable interest in the lighting of football grounds for play after dark, probably in order to increase the 'gate' by having the match at times when more supporters are free to watch it. Installations vary from quite modest affairs for small clubs to one such as that at the Wembley Stadium. There has been similar activity in France and elsewhere. Figure 8 shows the installation at Wembley, the training and adjustment of which was a considerable technical problem. It was carried out by day, aided by radio communication and a photo-electric receptor operating a galvanometer on the tower so that the technicians could watch the effects of their adjustments.

FIGURE 8. *Floodlighting for football: Wembley Stadium*

The lighting is designed not only to light the empty field evenly, but to provide a good view of the game for spectators, without glare, including a high kicked ball, and also a good view and a minimum of glare for the players, whose requirements are quite different from those of the spectators. This involves in some fields very careful design and attention to tolerances, and careful location of the floodlights, the supports for which become quite an engineering undertaking.

No mention of the use of light for entertainment would be complete without reference to the recent developments in France known as the *Spectacles de Son et Lumière*, in which they have exploited the beauties and interest of their fine *châteaux* and other historic buildings by producing a programme of music and spoken drama which accompanies a changing programme of lighting of the building, which is most effective. It is impossible here to convey the atmosphere of one of these displays, the best of which are very fine indeed. In some cases

it has been worth while to provide very elaborate dimming with automatic control from a master tape, and five-channel stereophonic sound reproduction of very high quality with loudspeakers developed for the purpose.

These *Spectacles* have become big undertakings to which thousands of tourists come; they involve all the organization of coach trips, and car parking, bookings and tickets, and the marshalling of thousands of people in the dark. It is a tribute to the genius of the French that they have not only achieved a new form of entertainment of high quality, but they have made it pay.

But in this country, in a very different way, we have also examples of lighting for entertainment which pays its way. We have on our north-west coast a rather desolate strip of flat and dull countryside, facing a stormy sea. There is a town there, swept in winter by gales, with a long dead-straight front and beach, unenlivened by a hill or cliff, or even a tree. It is an unpromising watering place. Yet that town boasts more visitors each year than any other five British watering places put together; and every year the season is prolonged for six weeks, bringing to the town some 3 million people, by a programme of illuminations which is unequalled in the world. It is hard to imagine a greater contrast with the refined and delicate French *Spectacles de Son et Lumière* than the robust fun of Blackpool, but in each of them lighting has made a notable contribution to life outdoors, and brought entertainment to many, of the kind they appreciate. The displays at Blackpool are masterpieces of ingenuity, and the scale of them—almost six miles of continuous and varied entertainment—is unrivalled anywhere.

So we finish at Blackpool, which we saw from the air at the beginning of this lecture, having been able to mention only a small fraction of the ways in which artificial light has made possible and is indispensable for maintaining the whole of our varied existence after dark, in travel, at work and at play. It is a luxury which has become a necessity, and more than a necessity: it is a prerequisite for modern life. As my colleagues develop the subject further, in interior lighting and in art and architecture, you may begin to appreciate our enthusiasm for a job of extraordinary interest, which touches almost every facet of human endeavour.

ACKNOWLEDGEMENTS

Acknowledgements are due to M. Jean Chappat (France); Dr. Lino Richard (Italy); Dr. Ing. E. von der Trappen (Germany); Mr. H. Carpenter (Blackpool); and Mr. H. J. Riddle (Siemens and General Electric Railway Signal Company) and other colleagues for information, illustrations and lantern slides used in this lecture.

II. LIGHTING IN COMMERCE AND INDUSTRY

by

C. DYKES-BROWN, M.I.E.E., F.I.E.S.

Monday, 25th February, 1957

INTRODUCTION

The majority of people spend an appreciable part of their active lives engaged in work, and this means, for a great many, long hours in offices or factories where the surroundings will probably influence, in one way or another, the mental and physical well-being of the worker. We have only to think back to the days of the industrial revolution, when men worked under grim and gloomy conditions, to realize how far we have since progressed towards a better environment for those who work indoors.

In these days the world demands high efficiency of men and machines, and to achieve this end the welfare of the worker is receiving more consideration than ever before. We know that for years men and women have worked in cramped surroundings; by comparison nowadays the employee is not only given better working conditions, but he expects to be provided with better heating, better ventilation, a canteen, and many other amenities. Experience has shown that efficient and well-planned lighting must also supplement these improvements.

The first person to contribute in the design of any building to the provision of adequate lighting, particularly natural daylight, is the architect, and he determines whether this should be admitted through windows or roof-lights. From the title of this lecture one might expect reference to be made to both natural daylight and artificial light, but I intend to concentrate on the part being played by artificial lighting in commerce and industry.

No modern building of any importance is projected without thought being given to the lighting system during the early stages of planning, so that provision can be made during its construction for the accommodation and installation of suitable lighting equipment. We do not have to look far to find examples which reveal that often much more interest is now taken in the choice and arrangement of lighting equipment to provide both efficient and comfortable seeing—particularly comfortable seeing, which is recognized as a very important goal towards which the lighting designer should strive.

During recent years we have seen the development of new light sources, new types of lighting fittings and many forms of plastic diffuser, which have brought us into an interesting era of lighting. With the range of lamps now available it will be useful to weigh up the pros and cons of the various types so as to appreciate both their merits and also the reason for their choice in different situations.

FILAMENT LAMPS

About 25 years ago the choice was very limited and a selection could then be made from the range of sizes and shapes in which filament lamps were produced. Incandescent or filament lamps no longer stand alone and now take

their place alongside a variety of electric discharge lamps. The following are the principle characteristics of filament lamps:

(*a*) They are available in sizes ranging from below 100 w. up to 1,500 w., as used in the larger industrial installations.

(*b*) The lowest initial cost is involved when compared with other light sources, no auxiliary equipment being required to operate them.

(*c*) They are easy to instal and maintain, and very simple to re-lamp.

(*d*) The output can be controlled with accuracy and flexibility, since the filament is small and can be regarded as an approximation to a point source of light.

(*e*) The average life is in the order of 1,000 hours.

(*f*) The lamps have an efficiency in terms of light output per unit of electricity consumed well below that of other sources.

(*g*) As filament lamps are too bright to be viewed comfortably, it is necessary to provide adequate shielding or diffusion of the light. Silica coated and pearl lamps are available in the lower wattages and are useful for local lighting and in some other positions where a high brightness would be troublesome.

FLUORESCENT TUBES

Fluorescent tubes of the hot-cathode type are available in lengths between 18 inches and eight feet, the most popular sizes being four feet and five feet long. Since the first tube in daylight colour was introduced, there have been demands for other colours, and now five different shades of white are available. These range between de luxe warm white, which emphasizes the red end of the spectrum and is especially suitable for social or recreational lighting, to the coldest colour, colour matching, which is desirable where judging of colour is necessary. The fluorescent tube is now widely accepted in commercial and industrial lighting, and has these features:

(*a*) low surface brightness—about $\frac{1}{50}$th as bright per square inch as a 500 w. filament lamp;

(*b*) it is of sufficiently low brightness to be viewed directly, provided the background is not dark;

(*c*) it has a long life, upwards of 5,000 hours;

(*d*) it is about three times as efficient as a 500 w. filament lamp;

(*e*) a choice of colours is available for different situations;

(*f*) it is not as easy to control the light in all directions from a fluorescent tube as it is with a filament lamp, due to the fact that the fluorescent tube is a linear source of light.

Another type, the cold-cathode fluorescent tube, is used less extensively, but has, nevertheless, attributes which have contributed to its establishment in the lighting field. It is made in a wider range of colours than the hot-cathode fluorescent tubes just described, and the lighting length is usually between eight feet and nine feet. Cold-cathode tubes operate on a high voltage, provided by special transformers, and consequently the capital cost of such an installation is generally higher than other systems. The exceptionally long life, normally

extending beyond 20,000 hours, is an advantage in situations where access is difficult and replacements can be installed only at infrequent intervals. Unlike other fluorescent tubes, the cold-cathode type can be made in curves to follow ceiling contours and also supplied in the form of a grid or spiral, similar to those installed behind the panelled ceiling in the Chamber of the House of Commons.

MERCURY VAPOUR LAMPS

The mercury vapour lamp plays a big part in industrial lighting and is frequently used for lofty interiors in sizes up to 1 kW. Its chief characteristics include:

(*a*) a high light output, enabling large areas to be lighted with the least number of fittings; and

(*b*) a long life, up to 4,000 hours.

These lamps are sometimes installed alongside filament lamps, especially in high bay areas to provide a blended light system, the greenish-blue light from the mercury lamps blending with the warm yellowish light from the filament lamps. The higher wattage lamps are unsuitable for low mounting heights and in general the 1 kW. mercury vapour lamps are installed at not less than thirty feet mounting height.

Colour-corrected mercury vapour lamps are rapidly becoming accepted in industry because of their good colour-rendering properties and may well supersede blended light units. These are also now available in sizes between 80 w. and 1,000 w.

ECONOMIC FACTORS

Sooner or later the question of economics has to be considered, and it is a factor which may influence a choice between two or more possibilities which can be expected to give satisfactory results.

The series of curves (Figure 1) shows installation and running costs of different systems. For the purpose of preparing the curves, a common basis of light output for each type of lamp or combination of lamps has been used and the corresponding cost of fittings determined. Allowance has also been made for lamp replacements, but the figures shown do not take into account labour costs for replacing lamps or other maintenance charges. It is interesting to see from these curves that:

(*a*) The 1 kW. mercury vapour lamp provides light at a lower cost than any other light source but, as already stated, its use is restricted to high bays and large areas.

(*b*) The fluorescent tubes have steeply descending curves and are relatively much more economical when the daily hours of use are increased.

(*c*) The value of the high efficiency 80 w. warm white fluorescent tube is apparent, and with its pleasing colour it has a wide range of applications.

(*d*) Cold cathode lighting becomes more economical with longer hours of burning.

The question of economics is by no means the only factor which has to be

considered when choosing the best light source, but the situation will often arise when two or more types of lamp may appear suitable for a particular installation; and it is then that a set of curves similar to these can save time in working out running costs to determine the lowest expenditure for a given set of conditions.

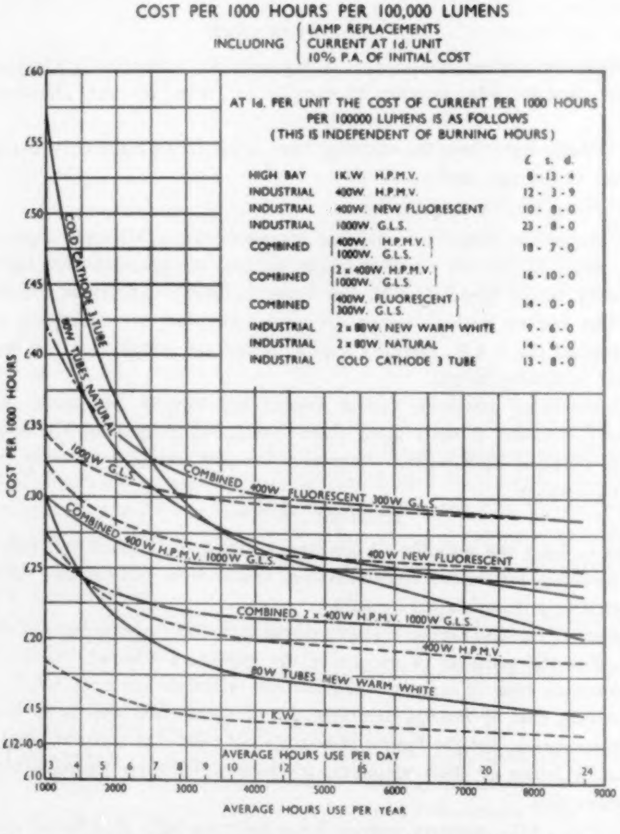

FIGURE 1. *Curves for comparison of costs on basis of burning hours*

QUANTITY AND QUALITY OF ILLUMINATION

Having reviewed briefly the characteristics of lamps which come within the scope of our subject, we can now see how they are being applied in modern installations. When any lighting scheme is planned due consideration is given to the quantity and quality of illumination required. These requirements will vary from one situation to another. For example, the amount of light necessary in the average store house will be totally inadequate for a drawing

office or fine assembly work in a factory. Reading a scale on a micrometer is harder on the eye than the visual work involved in spraying a car body in a motor car factory. In other words, the smaller the detail the greater the illumination required. This can easily be demonstrated with an ordinary sewing machine.

When the machine is running at slow speed, the general outline can be clearly seen under very low levels of illumination, but details of the smaller moving parts can be seen only with difficulty. If the level of illumination is increased details around the area of the needle, which were barely discernible before, soon become clearly visible. It is also interesting to observe that the moving parts do in fact appear to have slowed down when seen under increased illumination. From this simple illustration it is evident that more light is required to see small details and also more light is required to see a moving object than a stationary one.

In general, it is true to say that as the level of illumination is increased, a particular job can be undertaken with greater speed and more accuracy, but we usually reach a point when further increase in illumination would not always be warranted and in practice a compromise becomes desirable. The amount of illumination recommended for almost every situation likely to be found in present-day commercial and industrial undertakings is available and published by the Illuminating Engineering Society.

When designing a lighting system many other factors have to be taken into account in addition to the mere provision of light. Not the least of these is the avoidance of glare and unwanted reflections from bright and shiny surfaces.

A typical example where such precautions are essential is the provision of lighting for very fine work, such as watch assembly. This is frequently supplied from a continuous lighting trough supported about 18 inches above bench level and designed to concentrate the light in a downward direction and also conceal the source from the view of the workers. Reflectors with opaque sides and translucent top permit a proportion of upward illumination, which reduces the contrast between the work and the surroundings. Also undesirable reflections of the lamps are avoided by covering the benches with a suitable matt surface.

Many instances could be cited when it is necessary to take particular care to avoid specular reflections. The lighting of a telephone switchboard may be taken as representative. One method of providing ample light on the vertical and horizontal surfaces, without introducing troublesome reflections, is shown in Figure 2. The unit mounted on the top of each board contains two fluorescent tubes, the light from which is directed down to the switchboard by the use of specially designed reflectors. This provides remarkably even lighting especially on the vertical surface, from a system in which the light source is completely concealed from the operators by a number of black louvres in the underside of the canopy. The upper part of the fittings is glazed to allow general illumination in the exchange and so avoid the need for other light sources which might cause reflections to be seen in the indicator lamps.

Although we have referred so far to the avoidance of unwanted reflections,

there are occasions when the lighting specialist finds himself deliberately taking steps to produce highlights to enable a particular job of work to be done. The examination of new printing type before it receives its first inking is far from easy because the letters and background are of the same colour and have the same reflection factor. By positioning the light source to produce specular reflections from the type face, the necessary contrast can be provided which enables the letters to be seen quickly and clearly against their own shadow.

Specular reflections are also used in the inspection of polished surfaces such as car bodies, when scratches and irregularities in the surfaces are easily revealed by distortion of the image of the light source.

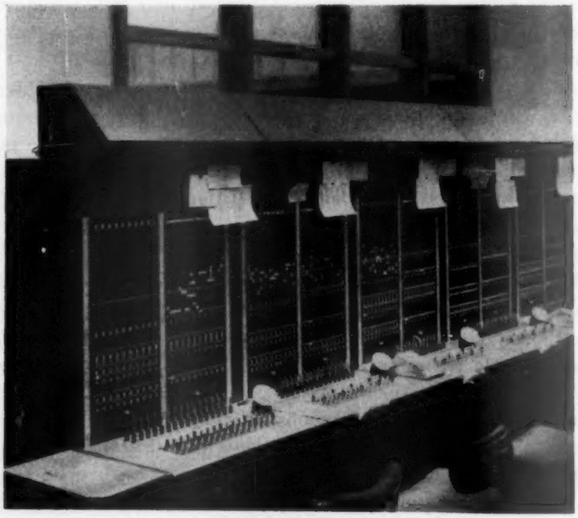

FIGURE 2. *Special lighting units provide a glare-free illumination on a telephone switchboard*

DRAWING OFFICES

I should now like to examine a typical lighting problem to which much attention has been directed in recent years. The lighting of drawing offices before the last War, on the whole, left much room for improvement. Filament lamps only were available for general lighting and more often than not it was the practice for each drawing board to be provided with its own local light. However well the lighting was planned there was always the risk of some glare from filament lamps. The contrast between the detail on which the draughtsman is working and the background may be very poor, especially when tracing a faint blueprint or worn pencil drawing, and consequently fairly high levels of illumination are desirable.

The need for higher levels of illumination in existing filament lamp installations could be met by increasing the number of lighting units or the size of each, but this might well result in increased glare, partly from the fittings and also by reflection from the drawing board to the eyes of the draughtsman. Harsh shadows along the edge of the T square and reflections from polished scales and set squares are also well known to draughtsmen who have worked in drawing offices with inefficient lighting. The introduction of fluorescent lighting has opened up a new approach to this problem, and it can be applied in a variety of ways to produce better results than those which have often been seen in the past.

In a typical drawing office, Figure 3, the original suspended filament lamp fittings have been removed and the ceiling has been divided into a series of parallel divisions by the introduction of wedge-shaped louvres at about three-foot intervals between the main beams. Cold-cathode fluorescent tubing has been installed between each pair of louvres and between the louvers and the beams to provide a high overall level of illumination. At the same time the light source is screened from the draughtsman's eyes when viewed from normal positions up and down the length of the office. The light ceiling and surroundings contribute to excellent seeing conditions with a complete absence of glare. Draughtsmen are not conscious of the light source, and in effect the ceiling becomes a large area of low brightness which provides a high level of illumination.

So often in the past the co-operation between the architect and lighting engineer has not always been as close as one would desire, but recently there has been

FIGURE 3. *Drawing office, showing louvres between beams, behind which fluorescent tubes are concealed*

evidence of a greater understanding of each other's problems. Architect and lighting engineer worked side by side during the planning of a new building to produce what is probably one of the best lit drawing offices in this country (Figure 4).

At the outset it was clearly stipulated that all draughtsmen should face the same direction, and this was taken into consideration when the scheme was developed. Specially shaped perforated aluminium troughs have been installed transverse to the length of the room, and are designed to direct the light on to the drawing boards, principally from the back of the draughtsmen. The possibility of specular reflection from ink or shiny paper has been minimized and shadows eliminated. This is an excellent example of the light source being concealed in a low brightness ceiling, without the draughtsmen normally being conscious of its location.

Although windows extending from floor to ceiling have been fitted along the wall seen on the left, the natural illumination decreases towards the far side, as one would expect. To counteract this, two photo-electric cells have been installed and are set so that the lighting farthest from the windows is switched on first as the daylight fades. As it fades still further the lighting nearest the windows is brought into use. When the daylight improves the lighting installation is automatically switched off in the reverse sequence.

In smaller drawing offices it is not always convenient to use a built-in system of lighting; specially-designed lighting fittings are available for such situations. They are equipped with anodized aluminium reflectors so shaped as to concentrate the light over a comparatively small area at drawing board level and at

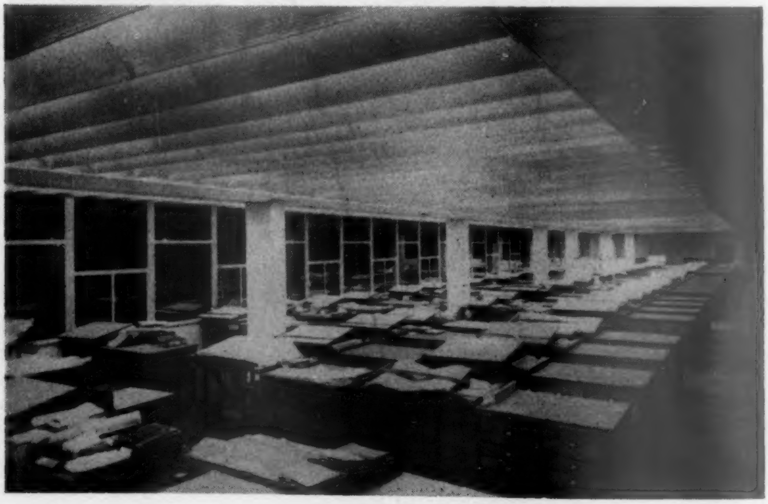

FIGURE 4. *Fluorescent tubes in specially designed troughs to provide high level illumination from low brightness ceiling*

the same time prevent to the image of the tube being seen by the draughtsman. Here again, the overall effect to the draughtsman is one of low brightness.

From the illustrations we have seen it is evident that modern drawing office lighting is designed to supply a high level of general illumination, frequently approximating seventy to 100 lumens per square foot from low brightness sources. Local lighting on individual drawing boards is also being dispensed with, although it may still be preferred by the older draughtsmen who became accustomed to positioning their light to suit themselves in the days when there was less illumination and shadows were more troublesome.

Modern structural technique often includes barrel-vault ceilings designed to admit direct daylight from one direction and also to reflect a considerable proportion from the curved ceiling on to the working area below. Buildings of this construction have been efficiently lighted by the installation of low-brightness fluorescent tubes which follow the contours of the ceiling design without disturbing its aesthetics.

HIGH BAY LIGHTING

The trend in industrial lighting is to provide a uniform illumination level throughout the working area. This is particularly desirable for interiors

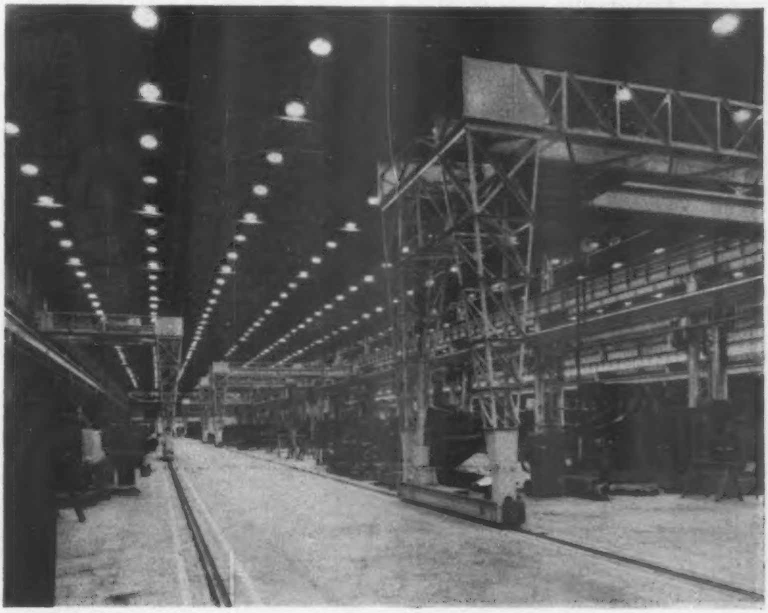

FIGURE 5. *An efficient industrial high bay installation using colour-corrected mercury vapour lamps*

where the production layout may be changed, so that light will be available at any point when needed. In the past, the tendency was to concentrate the light so that the maximum amount reached the working area and very little spread to the walls. The present practice is to instal a system which ensures a proportion of upward illumination to brighten the ceiling area, and also to use, when possible, light-coloured surfaces, to produce a more satisfactory and cheerful environment.

Many different types of lamp are used for lighting high bay areas associated with the heavy industries, and in some situations combinations of different lamps may be employed to fulfil the requirements. For example, overhead lighting may be by means of 1 kW. mercury vapour lamps, with additional side lighting from fluorescent tubes to light the vertical surfaces of high machines.

Specially designed reflectors are often used when mercury vapour and filament lamps are employed in combination with each other to ensure that the light distribution from each type of lamp is similar. It is also usual to design such reflectors so that they permit a proportion of upward light and at the same time create a draught through the fitting which reduces very considerably the settlement of dust on the reflecting surface.

A blended light system comprising tungsten and mercury vapour lamps has recently been replaced by 400-watt colour-corrected mercury vapour lamps resulting in increased illumination and decreased wattage consumption, to an amount of nearly fifty per cent (Figure 5). From the maintenance point of view, all lamps now have an average life of 4,000 hours compared with the former system in which the average life of half the lamps was 1,000 hours.

FIGURE 6. *Cold-cathode lighting installed in a workshop where access to the lighting units is difficult*

When access to the light source is particularly difficult, cold-cathode lighting may well be considered as a satisfactory solution.

In some heavy engineering shops work is frequently carried on continuously, and when the overhead crane is in regular use access to the lighting installation by this means is usually inconvenient. Consequently a lamp or tube which will operate without attention for very long periods has much to commend it. Even when burning 24 hours a day the cold-cathode tubes will remain serviceable for about three years, and if they are used during hours of darkness only the tube life will be approximately doubled and so extend to six years (Figure 6).

In common with all lighting installations, cleaning of the tubes and reflectors is necessary at intervals and this causes less interference with production when it can be done without having to make replacements at the same time.

ILLUMINATION AND COLOUR OF INTERIORS

However well the lighting may be planned, its ultimate efficiency will be considerably influenced by the colour of walls, ceilings, floors and indeed the colour of the plant and furnishings. A very dark ceiling will reflect little, if any, light back to the working area, and similarly, dark walls will absorb light instead of reflecting it.

Another simple experiment with the sewing machine already referred to in

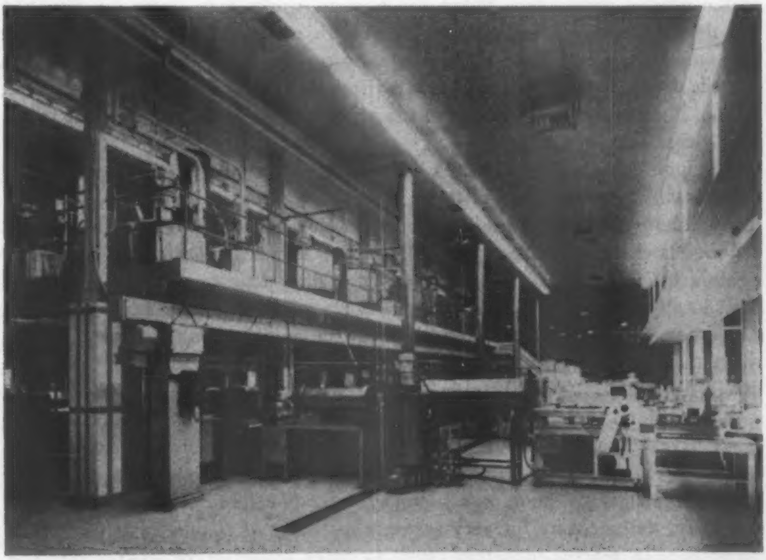

FIGURE 7. *Careful attention to colour treatment of walls, ceiling and floor produce a light and cheerful atmosphere*

this lecture will show the effect of changing the colour of the immediate surroundings. When the background against which the machine is seen and the operator's clothes are changed from white to black it will be found that considerably more illumination is required to see the detail of the work comfortably; in fact, this may have to be increased to over twice as much as when the white background and clothes were used. In some situations a glare source may be unavoidable, but when seen against a light background it is likely to be less troublesome.

A well-designed layout in which a bright and cheerful atmosphere has been produced by careful attention to colour treatment is shown in Figure 7. Not only have light colours been used for walls, ceiling and floor, but also the columns and machinery are equally light in colour. The overall effect is a cheerful and efficient working environment. More attention is now being directed to the colour of machinery and, while the colours may differ from one factory to another, it is usual to select one which contrasts with the material worked in the machine.

SPECIAL PROBLEMS

The principal accent on our theme has been general lighting, but in industry and commerce scores of problems arise in which artificial lighting plays its part in a highly specialized way. For instance, the lighting engineer may be called upon to design schemes for a number of diverse situations. The hazardous and corrosive atmosphere found in chemical works may claim his attention one day, while on another occasion he may be required to produce for a flight simulator an effect similar to that seen by a pilot flying through cloud at an altitude of 20,000 feet! While there is no time now to do more than refer to these, I should like to mention just one of the many interesting special problems which arise—that of colour matching.

Although considerable advances have been made in the development of light sources which enable colours to be matched reasonably accurately, there are many situations where even these will not always meet the needs of the individual. Colour-matching fluorescent tubes may not always be desirable for general lighting in stores, because of the cold effect they tend to produce and, when used locally, the purchaser of coloured materials is often far from convinced when they are seen under this light. We are all familiar with the scene in a store when the lady purchasing a skein of wool takes it outside to check the colour under daylight. It is doubtful whether she would be very impressed if the assistant behind the counter said, 'But Madam, there is no need to go outside, as we have fluorescent lighting here with a colour temperature of 6500° Kelvin which has a spectral distribution similar to that of daylight from a slightly overcast North sky at noon on a June day in the Northern Hemisphere'. Be that as it may, the necessity for very accurate matching of colours is of paramount importance in several industries, such as paint manufacture, colour printing, cosmetics, matching of furs and the dyeing of fabrics, to mention but a few.

Many materials fluoresce in varying degrees owing to a blue fluorescent dye

which is incorporated in them to increase their apparent brightness and whiteness. Consequently the modern colour-matching unit has to be capable of comparing fluorescent white and other materials having a fluorescent component. The latest design of unit contains tungsten, special fluorescent and ultra-violet light sources, and incorporates a means of adjustment to vary the ratio of fluorescent to tungsten light so as to compensate for variations in the visual response from different observers. Units of this type can be used in many situations for matching colours, and it will be interesting to refer briefly to one typical commercial application. Buyers in a West End office place orders for large quantities of coloured fabrics, the colours extending over a range of more than thirty different shades, many of which are pale pastel tints. When the buyer has selected the material he requires, an order is placed at the works in Scotland for a particular colour which is identified by name, and the material is duly delivered from the dyers.

In the past, difficulties have arisen when the materials supplied have not been an accurate match with the sample in London, although the dyers in Scotland contended that an excellent match was obtained with an identical sample. While two materials may be a good match under one quality of light they may well appear different under another. The match in Scotland may have been made in natural daylight on a bright day, but different results would be obtained in London if an examination were made under dissimilar daylight conditions.

These difficulties have been overcome by the installation of two colour-matching units—one in London and the other at the dyers. It is essential that matching be carried out under identical conditions so that agreement is obtained between the dyers and the buyers; both units are, therefore, adjusted to provide a similar match by using a special test scale made for this purpose. A buyer can, by this means, examine the material alongside a standard sample in the colour matching unit and be sure that if it were matched under similar conditions in Scotland there would be no argument about the wrong shade having been supplied.

STORE LIGHTING

Now we have brought the buyer into our review we think of stores and shops, and in conclusion can make one brief reference to the trend in artificial lighting there. The increasing popularity of tiled ceilings is leading to an extension of built-in lighting, and a good general illumination is obtained from a layout such as the store shown in Figure 8. The appearance of this type of installation is improved when the plastic diffusers project slightly below the ceiling level, as in this instance, and provide an interesting relief to an otherwise flat ceiling. Frequently these units are now supported by the framework of the suspended ceiling and can be installed, or removed, in a minute or so, thus facilitating quick and easy change of layout if desired.

There has also been in recent years a move towards complete luminous ceilings in which corrugated Vynil sheeting has been used. High levels of illumination are obtained from these with a low ceiling brightness.

FIGURE 8. *Modern lighting installation comprising units recessed into heated panel type ceiling*

In this very brief review we have seen something of the part being played by artificial lighting in the field of commerce and industry to-day. The subject covers such a wide territory that in the time available it has only been possible to refer to a few typical aspects, each of which might well form the subject of a separate lecture.

I have emphasized the need for adequate lighting and will leave with you one final thought—the average worker of sixty years of age requires considerably more light to obtain the same visual performance as his junior colleague, who is only twenty years old.

III. LIGHTING IN DECORATION AND ARCHITECTURE

by

D. W. DURRANT, F.I.E.S.

Monday, 4th March, 1957

In both preceding lectures, you may have noticed that the opening has stressed the necessity of light to man, because to humans the sense of sight is so vital. In a paper read in 1953, Professor Yves le Grand discussed the relative importance of the senses among different animals. This varies greatly:

> For most mammals, and even among insects, the sense of smell plays the chief part. Some almost incredible experiments have proved that butterflies can detect their females by smell over distances running into kilometres, which must be something of a nightmare.
>
> Among fishes, the most important senses are the sense of vibration and the sense of taste. With certain other animals, hearing is essential, sometimes at high frequencies, as with that extraordinary radar of the bats, which enables them by emitting ultrasonic vibrations inaudible to us to avoid knocking themselves out against the walls.
>
> But with birds and man, it is sight which plays the preponderating part; you know how we are at a disadvantage with the other senses—we hear fairly well, we smell extremely badly, and our sense of taste is almost atrophied. But on the other hand, our sight puts us relatively to the animals in a fairly satisfactory position, though it is not the best.

The principles of light are well known, and they do not change. We, however, continue to improve our techniques of applying them, and to make better equipment for use with man-made sources of light. Lighting as a science progresses, and for particular seeing tasks we are able to specify within reasonably close limits both the requirements and how they may be met.

If we were merely 'seeing machines', it is probable that we would ask for little better than the visual acuity now available, but a full life as we know it demands much more. Our moods and emotions are important to us, and demand more satisfaction than merely being able to see. In meeting this demand, the appearance of the surroundings is most significant, and artificial lighting comes into its own, for it can not only illuminate beauty, but it can create it.

It is not easy to define the difference between what we see with our eyes and what we are aware of mentally. Our mood largely determines our concentration, and if it is intense upon a particular object this so dominates our mental impression that we are unaware of much of our visual field. In a relaxed mood, we appreciate much more of what we see, so it is logical that the interiors where decorative art is most in evidence are those primarily for enjoyment rather than work. They are normally those to which we go from choice rather than because we must, and it is the contribution of lighting to this type of interior which we shall discuss here.

From the earliest times, man has had the urge to decorate, and in decorating interior lighting becomes an art rather than a science. With art, solutions are not exact, and measurement aids us little. Many famous classical buildings and paintings have often had their proportions analysed by the scientifically minded in an effort to discover a rule to success based upon measurement. But little has resulted beyond certain inconclusive claims to 'preferred ratios'.

But no rules for their use can be formulated, so we are back where we started—relying upon the artist. Fortunately, it is not quite as vague as it may sound, for even in art there are broad principles which help us, and to which I shall refer later.

But to return to our visual field. To most people it is most pleasing when it can be described as a 'picture'—in the conventional sense, and not one that can be hung upside down or sideways without anyone being the wiser! In this context, our picture has a main item of interest—a focus, having a background, which, although subsidiary, nevertheless consists of carefully placed masses and tones so that the whole is a balanced composition. These two words are the heart of our subject.

If we could make our interiors a series of such pictures with the same freedom that the artist has with his paints and canvas, our task would be relatively easy, but an interior has to be used by people, and can be seen from many viewpoints. These additional limitations pose a much more difficult problem, and we have to solve it on the basis of finding the optimum compromise. This word has somehow acquired a stigma, but it is the basis of all design, to be carefully evaluated and certainly nothing of which to be ashamed.

In essence, all concerned with designing and interior decoration have a common problem, and I suggest a common approach to its solution. This may be stated under five headings:

1. The convenience and habits of the user—the design must fulfil the purpose for which it is created.
2. All elements must produce a harmonious whole.
3. The result must either create or complement a mood — it must provide the right atmosphere.
4. To take advantage of improvements in techniques so that the result will be achieved in a better way or more cheaply than before.
5. It must be within the budget.

In decorative interiors there is rarely a requirement for a high degree of visual acuity, so that the limits set by the engineering side are less stringent and the architectural designer has very much more scope.

To-day the professional designer, in addition to his inherent artistic ability, has available the experience of the past and a fund of scientific knowledge such as no other age has ever had. Design evolves through any civilization, and a trend is discernible; it should not be confused with fashion, which swings rather like a pendulum, creating vogues which go to extremes and suddenly die. Being different for the sake of being different, rather than adopting a solution based upon requirements, is not serious design.

There are few who at one time or another do not have to exercise some choice of design, and many would like to know how to make their judgement both easier and more sure. A method available to everyone is observation, followed by analysis and practice. This involves looking around and identifying what is pleasing to us. Through press, books, television, cinema, as well as our own travel, we can see what other people are doing, and pick out the trend of design. Having found out what we like, it is then necessary to analyse why we like it. Look particularly for the following aspects:

COLOUR

This is generally considered a difficult subject. It is certainly a fascinating one, and it is beyond the scope of this paper to go into detail. Although it is essentially subjective, experience has shown that there is sufficient conformity of ideas to enable general rules to be formulated, which if observed will make success more probable than failure.

But colour can be subtle, and plays upon us tricks which might mystify until understood, and it would help everyone to have at least an elementary knowledge of the theory of colour.

Colours have three qualities: hue, intensity and value, and apart from the variability under different sources of light, other changes are induced due to the proximity of one colour to another, and also by the degree of contrast. One of the most important principles regarding the use of colour is achieving colour balance, such as the relative area of a strong intense accent colour which is required in order to balance with a larger area of cool muted background colour. A common practice is to work with large colour samples on site, and even the ablest designer cannot be sure of invariable success at the first attempt. It is often the cost of failure which confines people to the 'safe', but less interesting colour schemes.

The illuminated shades of lighting fittings can provide accent colour to a much higher brightness, and therefore impact value, than can possibly be achieved by other decorative surfaces.

FORM

Shapes are, of course, closely related to materials and the methods employed in manufacture. In keeping with a similar trend in architecture and furniture, heaviness is no longer considered an essential of quality. Neatness and lightness are preferred as more appropriate to the contemporary outlook.

As basic shapes become more simple, refinement of line and proportion become commensurably more important. Mr. Waldram has said, 'If we have to bang out shapes, let us make sure they are pleasing'.

Ornament can rightly be considered under this heading, and happily the pre-War phase is past when so much emphasis was placed upon the aspect of 'fitness for purpose' merely in the way of performance, that too often the results produced were cold, unfriendly and devoid of ornament, tending to ignore the emotional side of complementing the mood. To-day, we use ornament intelligently, recognizing it as both desirable and justifiable.

A further point to notice is that a balanced assymetry can be of greater visual interest than regular arrangements.

CONTRAST

A fundamental of interior decoration is that in order to have points of interest there must be places where there are none, and the right balance of contrast is essential to success. This most important principle applies to colour, pattern, texture and brightness. By the use of contrasts, modern decoration can avoid the worrying and restless effect of Victorian interiors, where something seemed to be 'going on' in all places at once.

The use of contrast is being enormously assisted by the increasing variety of pattern and texture now available. The intrinsic patterns and textures of natural and manufactured materials are well known, but these are being supplemented by textures arising from other considerations.

FIGURE 1. *Lighting was included as part of the architectural design in the dignified interior of the House of Commons*

LIGHT AND SHADE

The better appreciation of light and shade is contributing almost as much as colour in giving more visual interest to interiors. Perhaps the most obvious trend is the virtual disappearance of the completely indirect lighting scheme due to its monotonous and 'flat' effect. Pools of light and shade and sparkle used rather as highlights are used by a painter, now tend to liven the scene. To many, a ceiling of relatively high even brightness is considered undesirable. The use of small recessed fittings in an acoustic tiled ceiling can produce a surface and brightness pattern which is a decorative element in its own right, quite apart from its function for illumination.

It is obvious that these aspects are interrelated, and often overlap, but in summary the object is to produce a composition, having balance, good proportion, the right emphasis and pleasing modelling. Success will involve practice and experiment, and a small camera viewfinder, or a similar device made from cardboard, can be carried in the pocket and used whenever the opportunity occurs to practise the selecting of balanced compositions.

Having thus discussed what might be called 'the theory of designing decorative interiors', we are going to examine some illustrations to see how this is applied

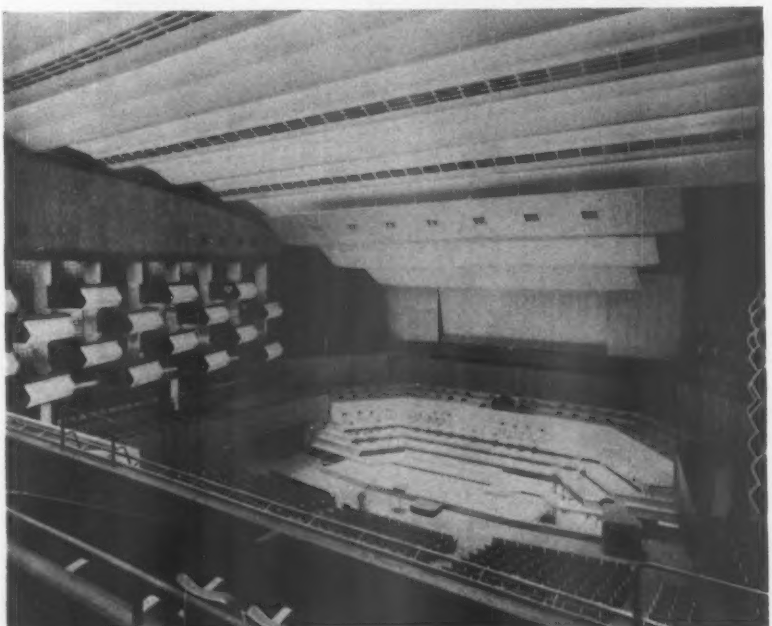

FIGURE 2. *The Royal Festival Hall, a modern building with lighting integrated with the interior design*

in practice. As colour is such a vital component in decoration, black and white illustrations are really inadequate. However, as they must be used for the written record, only a few examples will be included. In relation to what has been said so far in this paper, the illustrations should speak for themselves.

FIGURE 3. *Good lighting in a shop; but uninteresting, as the colours cannot be seen*

It must, however, be remembered that it is quite unfair and often inaccurate to judge an installation on the evidence of a photograph. The camera may also include only a small part of the normal field of view, and its relation to the whole is therefore completely ignored. This can be a particularly misleading factor. We can therefore only comment on an interpretation of the photograph itself.

Since the War, London has been fortunate in getting two outstanding buildings which are world famous as examples of decorative art, the new House of Commons (Figure 1) and the Royal Festival Hall (Figure 2). They represent completely successful solutions of the integration of lighting and architecture in two widely differing styles.

FIGURE 4. *Another Shoe Department, showing the greater interest created by the use of contrast*

Figures 3 and 4 show two solutions for the same mood, and both rooms are without windows, so that the conceptions are based only on using artificial light. Figure 3 represents a conventional solution relying almost entirely upon colour and texture for interest. As seen in the photograph, the shell lacks any

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FIGURE 5. *A transitional link with the past—a mixture of modern and traditional*

decorative focus, and the even brightness of the ceiling draws the eye without there being anything interesting to look at. As with indirect lighting, the tendency to flatten is quite apparent, and the atmosphere tends to look cold and impersonal; note the lack of modelling.

Figure 4 shows another solution, for the same mood, which makes an altogether different approach and results in a more lively and friendly interior. The ceiling has a general brightness comparable with the walls, which has a unifying effect on the curved and flat surfaces. The form, colour and lighting effect of the wall brackets play their complementary parts in making the fittings points of visual interest. The shape of the room is an important feature of the conception, and emphasis is obtained by change of colour, texture, pattern and brightness round the edge. The continuous slab provides a perfect balance and the heavy shadow relates it to the floor. Note how the asymmetric shape of the recesses and wall brackets is balanced by the regular pattern of their positions round the wall.

Figures 5 and 6 demonstrate the trend of design. Both rooms are in the same building recently rebuilt, and standard lighting fittings are used. A requirement for the interior shown in Figure 5 was that it should be a transitional link between the previous building and the new one. The cottage-type furniture, the bar and copper ornaments, retain the old atmosphere, whilst the wall treatment, fireplace

FIGURE 6. *A modern treatment for the same mood as Figure 5*

and fittings are modern. Figure 6 illustrates a completely contemporary interior. The bolder colour scheme can be imagined, and the greater use of contrast in texture, pattern and brightness can easily be seen. Note the lightness and neatness of the furniture compared with Figure 5. It is an interior of much greater visual interest.

The two views of the interior of a small church (Figures 7 and 8) show how the intelligent use of directional lighting and contrast can reveal the form of architecture. The walls and ceiling are near white, and the altar cloths provide a focal point of colour. A coherent flow of light across the church and chancel has been achieved by restricting the light sources to the south side. The play of light and shade on the altar and on the mullions of the east window makes their solidity apparent, and Figure 7 shows clearly how the high-lighting on only the left-hand side of the chancel arch reveals the form and character of the moulding. By using higher brightnesses on the surfaces seen through all the arches the shapes are defined, and the effect is subtly emphasized by slightly altering the colour of the light in the nave compared with the rest of the church.

Figure 9 has been included to illustrate how lighting fittings can be used to furnish space. The room is used for dinners and dances, both of which require a friendly atmosphere, and the mood for dancing is more intimate than that for eating. The architecture can hardly be said to assist this, but rich, warm curtains and carpets are helpful. The detail of the large chandeliers is harmonious with

FIGURE 7. *Form is revealed by shadows. Directional lighting is used to high-light the mouldings*

FIGURE 8. *Another view of the church, showing the architecture emphasized by change of colour and brightness*

the architecture, and their wide spread and brightness form a barrier of interest which was used to detract from the height of the ceiling. Pleated silk shades and silk-covered suspensions provide the rich softness which was wanted and which was lacking in the combination of metal and glass only. For dancing, the light can be reduced and warmed by switching from white to pink-coloured lamps in the centre bowls, with or without the candles. The brackets are obvious centres of interest and ornament on a long wall of unpatterned surfaces, and their lighting effect on the wall emphasizes this function.

FIGURE 9. *Large lighting fittings used to furnish space and give the effect of a lower ceiling*

In the three lectures, we have seen how after dark we depend on artificial lighting for our information, safety, work; our commerce, our travel, our relaxation; a large part of our domestic life, and a great part of our culture.

We have endeavoured to present without exaggeration an assessment of its contribution to our welfare and our happiness, showing that it is indispensable to modern life, and we feel sure that few will deny that 'Better lighting means better living'.

GENERAL NOTES

REPORT ON 'INDUSTRY AND TECHNICAL PROGRESS'

The last War was characterized by the most outstanding concentration of scientific effort and technological innovation this country, and indeed the world, has ever seen. It was not surprising therefore that in the almost equally strenuous post-war period, it became ever more certain that the increasing application of science and technology would be vital also to the economic survival of Great Britain. However, this certainty stood clear of a long-continued debate on ways and means, of the scale of application and on the attribution of causes and shortcomings, which was complex and altogether confused for lack of exact knowledge of the facts. Opinion masqueraded as authoritative theory, and adverse comparisons with other countries were frequently based on the truly British theological doctrine that original sin is geographically distributed; none abroad but, in this country, endemic.

It was in this period that the Council of the British Association for the Advancement of Science, meeting in Belfast in 1952, appointed a Committee 'to study the problem of speeding up in industry the application of the results of scientific research'. A preliminary consideration showed that a substantial new investigation was needed, and this was subsequently sponsored jointly by the British Association, the Nuffield Foundation and the Royal Society of Arts. Funds were provided first through the Board of Trade under the 'Conditional Aid' scheme, and later supplemented by the Department of Scientific and Industrial Research, making the total sum about £20,000. The new Committee, representative of all three sponsors, first met in April, 1954, with the following enlarged terms of reference:

> To identify those factors which determine, in different industries and in different types of firms, the speed of application from scientific and technical knowledge; to examine their relative importance, their interrelations, and their correlations with characteristics of the firm or industry; to obtain evidence of the effectiveness of measures already taken to speed up the application of science in industry, or to remove hindrances to such application, and to examine the possible results of other proposed measures.

These terms of reference were subsequently still further extended to include 'factors influencing innovation' and the collection of case material to contribute to the knowledge of the background of investment decision.

The first fruits of this notable co-operation have now appeared in a book entitled *Industry and Technical Progress: Factors Governing the Speed of the Application of Science* (O.U.P., 25*s*.), which is concerned with the factual part of the main terms of reference. It is lucidly written on behalf of the Committee jointly by the Chairman, Professor C. F. Carter, the Queen's University, Belfast, and the Secretary, Professor B. R. Williams, University College of North Staffordshire, Keele. Let it be said at once that this is a valuable and stimulating report, and that the authors, the Committee and their sponsors are to be congratulated on its timely appearance.

In a fascinating chapter on 'Pushes and Pulls', the authors classify firms into four broad categories, characterizing their readiness to take and give knowledge. At one extreme is the *parochial* firm, self-satisfied within its self-imposed and narrow limits, 'with no organized inflow of technical information—and no one capable of understanding the information if it came, [which] believes itself to be different; that it has no need of outside help or stimulus; its failures are due to unkind fate or the wickedness of governments'. Next: in the middle position, are 'firms which are receptive to new ideas but which rely on some other firms or agency to provide them'. Those which could not develop their own ideas even if they wanted to are called *involuntarily adoptive*: those which could support their own research and

development, but have chosen not to, are called *voluntarily adoptive*. At the other extreme from the parochial are those firms which are neither parochial nor parasitic on the development work of others, and have positive attitudes and achievements in regard to technical innovation. These are called *non-parochial, non-adoptive*. A rough classification was made of 130 out of 152 firms in the general case-studies compiled in the research, with results set out in the following table:

	Progressive Per cent.	*Moderately Progressive Per cent*	*Non-Progressive Per cent*
Parochial	—	—	32
Adoptive (involuntarily)	2	17	9
Adoptive (voluntarily)	2	23	23
Non-parochial, non-adoptive	96	60	36
	100	100	100

As the Report says, 'The results, showing percentages in each category of progressiveness, speak for themselves'. The results are further analysed according to industries and employment of technicians, engineers and scientists. 'The concentration of parochial firms in the traditional industries and in industries relying on technicians is significant'.

The Report is likely to gain support because it repeatedly refuses to make sweeping assertions and indiscriminate condemnation. But this should blind no one to the seriousness of some of its statements. As an example of both these aspects of the Report, the following paragraph is typical:

> British industry is not universally backward in scientific matters, but is uneven in its development, with a great range from the best to the worst firms. We have found many firms which need fear no comparison with similar firms anywhere in the world: but we have also found firms which have shocked us by their ignorant complacency. Although all countries must expect to have some unprogressive firms we do not think this justifies the parochialism of large tracts of British industry.

Again on the debit side, the Report notes the lack of cost-consciousness in a large number of firms, and an inadequate regard for recruitment and training of personnel at different levels is also too widespread, well beyond the parochial firms. The Report lists 24 criteria of a technically progressive firm, an innovation which in itself can hardly be ignored in the board room of the future. Incidentally, this list could with slight adaptations form equally challenging criteria for technical institutions, including as it does such aspects as: high quality of incoming information; a deliberate survey of potential ideas; a readiness to look outside (the firm); effective internal communication and co-ordination; a consciousness of costs in the research and development departments (if any); rapid replacement of machines; a sound policy of recruitment for management; an ability to attract talented people; a willingness to arrange for effective training of staff. . . .

As the Report emphasizes repeatedly, the acute problem is how to get beneficial change where it is most needed, in the backward areas of the table quoted above. By their unresponsiveness, their inferior prospects and general working conditions these firms are unlikely to recruit the superior talent and experience necessary to remove the defects of which they are unaware. As with conferences, so with Reports,

the problem is to reach the unconverted. For this reason, the Report should have the widest possible publicity by newspaper and journal, radio and T.V.

Before the War such a report would have been in almost solely scientific and technological terms. As it is, after a brief consideration of these basic facts, and an implicit assumption that the scientific problems can be solved, the emphasis in practically every chapter is strongly towards the social aspects of the problems, including the psychological. The whole question of attitudes is repeatedly stated and shown to be vital—attitudes of firms and the public to change and innovation ('men who are proud of *not* doing what their fathers did'); attitudes to management and within management, the whole complex of personal relationships within firms and of the problems of leadership in firms; questions of secrecy between firms and of restrictive practices; attitudes to financing new developments. On the encouraging side, the Report finds 'that the hindrances caused by labour though significant and in part removable by good management, cannot be regarded as a major determinant of the speed of scientific and technological advance, at least in the period 1945–1956'. It also concludes that Government action has generally been favourable, and that the effect of taxation is more limited than supposed, though bearing unfavourably on new ventures and family concerns. For the special pleader, the Report comes to the chastening conclusion that 'whereas the evidence suggests that scientists are often to be found among the directors of progressive firms, the grounds for concluding that the leading personality in the firm is likely to be a scientist are inadequate'.

With these and many other points in mind, it is a matter for regret that so little emphasis and space is given to education and training for management *after entry* as compared with a whole chapter on the subject, important though it is, of 'trained men and women' *for entry* to industry. But this may well be in the future Reports, which are promised on 'other proposed measures', and which, on the excellent beginning made by the Report, will be eagerly awaited.

With these points and the increasing significance of the social sciences in mind, it is a matter for comment how minute are the resources at their disposal for researches of this kind, compared with the vast expenditure of science and technology to-day. If they can muster the resources, the three sponsoring bodies might well turn their attention to the lack of support for the social sciences as a critical limiting factor in itself.

P. F. R. VENABLES

THE IMPERIAL INSTITUTE

The Annual Report of the Imperial Institute for 1956 records the steady growth of educational and cultural activities on behalf of the Commonwealth. During the year under review there was a marked increase in the numbers of those who visited the galleries of the Institute, where entirely new permanent exhibitions for the West African countries and for the Federation of Rhodesia and Nyasaland were to be seen, in addition to some notable acquisitions, the temporary displays related to topical events, and the exhibitions devoted to the work of Commonwealth artists. This is only a part of the picture of development, for as the Director writes, 'through its work in the schools, its travelling exhibitions, and its visual aid services, the Institute now reaches probably two or three times as many people in all parts of the country as visit the Institute itself'. Another encouraging aspect of the Institute's work in 1956 has been the increase in the courses in race relations for those going overseas in government or commercial employment. It is good to be reminded that there is a possibility of saving the tower of the Institute when the Collcutt building is demolished—a matter on which, as Fellows will remember, the Society made representations in several official quarters.

The report includes a new feature, the first annual report of the newly founded Scottish Committee, made by its chairman, Sir Robert Russell, who describes the vigorous and forward-looking activities of the initial year.

YOUR HOUSE ON VIEW

An attractively produced and illustrated booklet of this title has just been published for the Central Panels Committee of the Council for the Preservation of Rural England and Wales, the Royal Institute of British Architects, and the Institute of Builders. It is intended to help the builder, the local authority, and all those engaged in small house design by stating and exemplifying the basic principles of good design and planning. In view of the increasing volume of housing development since the war, it is more than ever important to recognize what these are. This booklet includes notes on grouping, access roads, sites, and trees under a general heading, 'The Estate Layout'. Landscape setting, siting, connecting links between houses, design and materials, gates and garden boundaries, paintwork and building complete this section, which is followed by a detailed consideration of the house itself. This lays emphasis both on types of houses and particular features of their design, such as the placing of bay-windows and chimneys. There is also an interesting brief mention of improvements and conversions, which is a useful reminder of what may be done to preserve existing property. The notes are brought to life by many excellent photographs.

This booklet makes no attempt to reduce the aesthetics of architecture and layout to a formula; but it does show, as the Minister of Housing and Local Government writes in his foreword, that 'A good design . . . need not cost any more than a bad one. It is so often a matter of good proportions, simplicity, and a regard for surroundings.'

Copies of the booklet, price 3*s*., may be obtained from the publishers, the Council for the Preservation of Rural England and Wales.

OBITUARY

It is with regret that we record the death of two Fellows of the Society:

THE EARL NELSON

The Earl Nelson died on 23rd June, aged 66.

The Right Honourable Albert Francis Joseph Horatio Nelson, sixth Earl Nelson, of Trafalgar, and Merton, Viscount Merton, of Trafalgar, and Merton in the county of Surrey, and Baron Nelson of the Nile, and of Hillborough in the county of Norfolk, the eldest son of the fifth Earl, was born on 2nd September, 1890, and educated at Downside and abroad. In his younger days he travelled widely, in Australia (where he worked as a mining prospector), New Guinea, North Borneo and Malaya. He served with the Australian Imperial Forces in the First World War and, in the Second, in the Merchant Navy and the Indian Army.

The annuity granted to the Nelson family after the Battle of Trafalgar was stopped by Act of Parliament in 1947, a proceeding which caused some stir in the public press. The sixth Earl, who succeeded his father in 1951, did not defend hereditary pensions as a principle, but he regarded the termination of this annuity as 'the greatest breach of faith ever perpetrated by any British government', and in the last years of his life he tried unsuccessfully to obtain some compensation in lieu of the annual payments.

Lord Nelson was known for his interest in astronomy and anthropology. He was

the author of *Life and the Universe* (1953) and *There is Life on Mars* (1955): the latter had a marked popular success. It was noticed in the *Journal* for 2nd March, 1956.

Lord Nelson left no children, and the family honours pass to his brother, the Honble. Henry Edward Joseph Horatio Nelson.

Lord Nelson was elected a Fellow of the Society in 1950.

MR. F. A. BATES

Mr. Frederic Alan Bates, M.C., A.F.C., D.L., formerly chairman of the Cunard Steamship Company, died in London on 23rd June, aged 72.

Born on 16th August, 1884, the fourth son of Sir Edward Bates, second baronet, Frederic Bates was educated at Winchester and Cambridge, and had a distinguished record of service with the Denbighshire Yeomanry and the Royal Air Force in the First World War. A member of one of the great merchant families of Liverpool, he was chiefly associated with Martin's Bank, of which he was chairman for many years, and the Cunard Company. He was elected chairman of the latter in 1946, and was also a director of Edward Bates & Sons, Ltd., of T. & J. Brocklebank, Ltd., and of the Port Line, Ltd. Mr. Bates was a Deputy Lieutenant for Flintshire, and Sheriff of the county in 1935.

Mr. Bates was elected a Life Fellow of the Society in 1951.

FROM THE JOURNAL OF 1857

VOLUME V. *3rd July*, 1857

LAPSUS CALAMI

In the list of certificates awarded [in the Society's London examinations], given in last week's *Journal*, under the head 'Political and Social Economy', a certificate of 'Proficiency' in this subject appears opposite the name of W. W. Smith. This certificate belongs to Thomas Mirehouse, of the Royal Polytechnic Institution. This mistake arose from the candidate having affixed a wrong number to his papers.

—AUT MEMORIAE?

Sir,—You will oblige me by correcting an inaccuracy in your report of the Conference [between the Society and the Institutions in union] held on the 24th inst. I am made to say that I thought the value of the broad sheet *was overrated*, &c., whereas I said (what experience has taught me to be true) that the value of the broad sheet *could not be* overrated, and I added that it was not to be expected of working men generally that they would attend classes for instruction after a hard day's work. Hence the value of the knowledge imparted by means of the newspaper. I certainly said that something more than daily and weekly newspapers should be placed on the reading-room table—that such publications as the *Quarterly Review*, for instance, should not be excluded, but I would never extol the latter *against* the former. I consider *both* essential to the reading-room of a useful Mechanics' Institution.

I am, &c.,

Croydon, June 27th, 1857. S. L. RYMER